

ANTECEDENTS AND DYNAMICS FOR STRATEGIC ALIGNMENT OF HEALTH INFORMATION SYSTEMS IN UGANDA

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ABSTRACT

Health Information Systems (HIS) in Uganda always fail to achieve the organizational objectives and yet little research has been conducted to study the strategic alignment of HIS in the country. This study therefore set out to examine the antecedents and dynamics that influence strategic alignment of HIS in Uganda with the aim of adequately addressing the complex IS design issues. A total of 296 respondents were purposively selected from 39 health facilities across the country to participate in the survey. Data was analyzed using descriptive statistics.

Findings from the study revealed that HIS are used to locate substitute sources for medical commodities, reduce costs of handling orders as well as minimize uncertainty in ordering lead time. In addition, HIS provide information to clients, add value to existing health services and are used to target health service needs with accuracy as well as identify groups of clients whose needs are not being met. HIS are used to minimize the cost of designing services, adding features to existing services and population grouping services at the health unit level. In the area of internal health facility efficiency, HIS help in ensuring efficiency and enable informed decision making, provide efficiency in internal meetings and discussions, co-ordination among facility departments, and provide good evaluation on annual budget. Further, HIS are used by health workers to provide evaluation on capital, maximize organizational performance, population coverage and strategic planning efficiency.

Despite the above, the study revealed that health units do not have standards, frameworks and policies for the strategic alignment of HIS and the funding to support them. For better alignment of HIS, there should be proper planning and training of health workers on the importance of strategic alignment of HIS. Further, health facilities should be encouraged to adopt electronic information systems to improve their efficiency and effectiveness. There should also be policies, frameworks and or standards for guiding strategic alignment of Health Information Systems in health facilities.

1. INTRODUCTION

Strategic alignment is a state of dynamic coherence between the business, Information Technology (IT) strategies and supporting systems such as Information Systems (IS) infrastructure (Lapiedra et al., 2006). Although business to IT alignment has been among the top management concerns in organizations for over two decades, the practice remains a challenge to many implementers due to external forces, like cost and transformation of Information technology (Luftman, 2007). Lack of policy and frameworks for information system strategic alignment and standardization has fueled the parallel implementation of Health Information Systems (HIS), poor coordination of health information from the private and government health service providers and poor utilization of existing information for national planning and policy development. Health Information Systems in this context refer

to systems that capture, store, manage and transmit information related to the health of individuals or organizations that work within the health sector.

In Uganda, much of the healthcare system is still operating using manual methods for information gathering, entry, processing and report generation. However, there are initiatives being undertaken to digitize these processes. To that effect, several hospitals have attempted adopting records management systems, with much difficulty. Kituyi et al. (2012) argue that Mulago, Nsambya and a few other hospitals are in the process of computerizing their systems. Some international agencies such as the World Health Organization, the World Bank, USAID, and UKAID among others are encouraging the use of computer based Information Systems to increase efficiency, transparency and accountability (Netchaeva, 2002). Despite these efforts, many health information systems in Uganda have failed to live even for one year. Kituyi et al. (2012) and Isabalija et al. (2011) argue that the failure of HIS also commonly known as telemedicine is mainly attributed to lack of information on how to sustainably implement and manage such system. Some of the factors such as lack of knowledge and resources also heavily affect sustainability of HIS (Kituyi et al., 2012). For many implementers the decision to implement and select appropriate IS for healthcare organizations remains a challenge (Gans et al., 2005); and yet the research and success lessons are still insufficient (Bush et al., 2009). Although little has been done to study strategic alignment of HIS in Uganda, research in other countries indicates that strategic alignment of health information systems is a critical factor in successful implementation and use of HIS thereby presenting the urgent need to examine the antecedents and dynamics that influence strategic alignment of HIS.

2. RELATED LITERATURE

Although, no specific information systems strategic alignment method exists, several general information technology strategic alignment methods and models have been developed to guide strategic alignment of information technology in organizations. Some of these include the Strategic Alignment Model (Henderson & Venkatraman, 1993) which has business and Information Technology domains as well as internal and external perspectives; the strategic fit model (Melville et al., 2004), which is a multidimensional model and a tool for the analysis of IT-Business alignment and the multifactor productivity measurement model (Sahay, 2005) which focuses on analyzing alignment gaps at the strategic level while omitting the role of organizational processes in strategic alignment (Hsu et al., 2009).

According to literature, most IT strategic alignment models are extensions of the Strategic Alignment Model (SAM) proposed by Henderson and Venkatraman (1999; see also: DesRoches et al., 2008; Bush et al., 2009). SAM is constituted by business and Information Technology (IT) domains and internal and external perspectives. Business to IT alignment is achieved through the interaction of elements within the four domains of SAM, that is: business strategy, organizational infrastructure and processes; IT strategy and IS infrastructure and processes. The strategic alignment process involves mapping parameters in the different domains in a linear manner and an alignment gaps exists when “strategic fit-business strategy elements are influencing the IT transformation” and “functional integration- and when the IS infrastructure and processes are integrated into the organization infrastructure and processes to enable achievement of organizational goals” are not fully achieved.

Despite the popularity of the Strategic Alignment Model (Milis et al., 2008), researchers have described its alignment concept as “elusive”, lacking in definitional rigour and precision necessary to constitute measurable alignment (Chan & Reich, 2007). In response to the above concerns Melville et al. (2004) developed a multidimensional model and a tool for the analysis of IT-Business alignment known as the I-Fit model. This was

constructed on four building blocks: IT governance (representing the decision rights on IT, IS and their coordination); strategic alignment (representing a driver, lever, impact during alignment execution, strategic FIT & functional integration); Information quality (representing the FIT of information needs and services) and business process performance (multi level-multi actor-multi goal interaction in the organization environment). The four building blocks are related through a linear value generation process which leads to organization performance. The alignment gaps are defined by the difference between organization information needs and information provided to the organization. However, the I-Fit model does not define a feedback process which is a vital process in complex multi-factor organizational relationships. The concept of 'multifactor analysis has been presented by some authors of alignment models as multidimensional analysis (Henderson & Venkatraman, 1993; Milis et al., 2008) and by others as multifactor analysis (Sahay, 2005). This multifactor analysis approach focuses on alignment analysis at the strategic level but omits the role of organizational processes in strategic alignment (Hsu et al., 2009). Continuous improvement and proper fit between business process tasks and information systems exist when the business environment and business process are in a state of fit (Trkman, 2010). Hence IS related strategic alignment is highly dependent on the functional relationship between the business environment and business process.

Most of the models ably address issues of scope, competence, governance, structure, processes, skills, business and Information Technology domains. However, none addresses the issues of dynamic multi-factor analysis. In addition the models do not address actor/user involvement, except the I-Fit by Melville et al. (2004) and cannot ably solve the complexities involved in HIS strategic alignment given the limited knowledge and skills of most users of HIS. Although strategic alignment requires involvement of all stakeholders, the listed models do not involve all actors. The role of multi-factor interactions involving static and dynamic factors, in an information system environment is not adequately captured. The complex nature of the organization environment (Mason, 2007), the need for continued monitoring and adjustment of alignment parameters, and supporting IS, calls for a shift from the traditional strategic alignment and analysis techniques that use static parameters for a one-off observation to those that can capture dynamic parameters within the organization's IS environment (Avila et al., 2010). In order to respond effectively to the demands for structural and IS changes in the organization, managers need to understand the complex interactions in the organization environment through the systems approach. However, most of the traditional techniques for identifying information system requirements are 'project-based', with a definite start and stop. Besides the existing models are linearly developed, they cannot adequately address complex IS design issues for the health facilities. This study therefore set out to examine the antecedents and dynamics that influence strategic alignment of HIS in Uganda with the aim of adequately addressing the complex IS design issues.

2.1 The Ugandan Health Service

In Uganda, the need for strategic alignment within the National Health Service (NHS) arises from the existence of several healthcare service providers deploying different IS. The National Health Service (NHS) is constituted by: the Public Health Service (PHS) sector with government owned health service centres and the Private Health Service sector with Private Not-For-Profit (PNFP), Private Health Practitioners (PHP), the Traditional and Complementary Medicine Practitioners (TCMP); and the Communities, (MoH, 2009, 2010). The two sectors represent different institutional structures that define their HIS design and implementation. While the government owned PHS centres use the Health Management Information System (HMIS) designed to support the execution of the National Health Service strategy (MoH, 2009), the private health service providers use largely, institution specific

Information Systems designed with limited use of HMIS tools. These discrepancies have led to poor execution of the National Health Service strategy (PEPFAR & CDC, 2010) and the related poor performance of the HIS; hence the need for an alignment model that can be flexibly applied at different health service levels to inform planning and implementation of Information Systems related strategic alignment for the health facilities as well as effective execution of strategic goals. This need calls for a shift from the traditional strategic alignment and analysis techniques that use static parameters for a one-off observation to those that can capture dynamic parameters within the organizations' IS environments (Avila et al., 2010). Moreover, many of the antecedents are unknown.

In addition, Uganda lacks policies to guide strategic alignment at national level (MoH, 2010). There are hardly any standards for governance of health information systems. This makes it difficult to plan and coordinate HIS strategic alignment (Paolucci & Neirotti, 2007; MoH, 2009; PEPFAR & CDC, 2010; MoH, 2010). Further to this, strategic alignment of health information systems in Uganda is inhibited by limited involvement of stakeholders, thereby hindering resource mobilization (Bleistein & Cox, 2006). There is also lack of well established business processes for Health Information Technology (Strnadl, 2006).

3. METHODOLOGY

In this study, a quantitative research approach was adopted. According to Avison and Heje (2005) as cited by Kituyi et al. (2012), quantitative research methods "allow information systems researchers to answer scholarly and pragmatic questions about the interaction of humans and artifacts such as computer systems and applications". This is done by conducting quantitative analysis on the primary data, which is normally generated using questionnaires (Kothari, 2009). Straub et al. (2004) argue that the main research methods employed in using quantitative research include surveys and laboratory tests, although, sometimes, it is applied in case studies. The quantitative approach provided quantitative data that was used to analyze the antecedents and dynamics for strategic alignment of HIS. It also enabled a quantified assessment of alternative ways of improving system performance (Wolstenholme, 1983).

Semi-structured interviews were conducted at the first-level primary facilities and hospitals; and district decision makers. The purpose of the interviews was to explore the experiences, views, sources of information and attitudes with respect to HIS standards, frameworks, policy and funding options in the studied health facilities. It also elicited insights on HIS system quality, information quality, service quality and organizational performance of HIS. The interview guides were informed by the information gathered during the brainstorming sessions that that were held at the beginning of the study and also allowed for exploring additional aspects or problems raised by the respondents through open ended questions. The research instrument was designed and tested for validity and reliability using Cronbach alphas Reliability Coefficient (CARC) and Content Validity Index. Table 1 shows validity and reliability results:

Table 1: Validity and Reliability of the Questionnaire

Variable	No of items	CARC	CVI
HIS Standards, Frameworks, Policy and Funding in health facilities	6	.705	.785
System Quality, Information Quality, Service Quality and Organization Performance	21	.771	.763

Validity and reliability results seen in Table 1 indicate that the research instrument was reliable and valid given that all variables score Cronbach Alpha Reliability Coefficient and Content Validity Index greater than 0.7 (Cronbach, 1951).

3.1 Study Population and Sampling Criteria

Health service facilities currently using Ministry of Health supported Health Information Systems were selected using the purposive sampling method. The health facilities selected were 100% government owned or partially government supported facility that had been in existence for at least 10 years. Facility documents, policies and strategies were reviewed for information on HIS strategic alignment activities over the 10 years

The study covered a total of 39 district hospitals, referral hospitals, Health Centre IVs (HCIV), Health Centre IIIs (HCIII), Health Centre IIs (HCII) and one medical Centre of Excellence operating under Mildmay Uganda. The hospitals and other health centres that participated in the study were selected from various districts in the central region of Uganda. The central region of Uganda was selected because this is the region the highest of hospitals operating under Mildmay Uganda. From the above population, purposive sampling method was used to select 5 respondents from each Health Centre II, 15 respondents from each district and referral hospital, 10 respondents from each Health Centre IV, 6 respondents from each Health Centre III and 5 respondents from each Center of Excellency. From all the participating health units, the research had a total sample of 296 respondents.

The above selection was based on the size of the participating healthcare institution. Although there is no known single population for any grouping as indicated above, the general structure these health organizations is such that a referral hospital has a bigger geographical coverage. For example a referral hospital covers an entire region of a country comprising of several districts. Therefore, it is expected to have more staff and patients compared to lower hospitals. This is followed by district hospitals that cover a single district. After district hospital, there is HCIVs covering a county, HCIIIs covering a sub-county and HCIIIs covering a parish. Mildmay Centre of Excellence is outside the above description. It is an independent non-governmental health center that offers specialized healthcare services but to a few clientele. Hence, it is smaller than any of the five described categories. In this study therefore, the number of respondents selected depended on the geographical scope of the participating healthcare institution, such that those covering a bigger geographical area contributed more respondents. This mechanism was used so that there is some representativeness of the study population within the selected sample size. Further, there was an effort ensure that the study sample was within the minimum requirement of 30 to 500 respondents for this kind of study as stipulated by Roscoe's (1975) rule of thumb.

3.2 Data Analysis

Data was analyzed quantitatively using descriptive statistics and *t*-tests. Data is presented in tables. The choice of the analysis and presentation method was influenced by the need for simplicity and ease of understanding of results.

4. FINDINGS

The findings of the study associated with the strategic alignment of HIS are presented in the following themes: a) HIS standards, frameworks, policy and funding for health facilities and b) System, information and service quality and organization performance as explained below:

4.1 HIS Standards, Frameworks, Policy and Funding in Health Facilities

Data was gathered to examine the HIS standards, frameworks, policy and funding options in health facilities. Table 2 presents the results of the findings from the respondents:

Table2: HIS Standards Framework, Policy and Funding in Health Facilities (N=296)

Parameter	Min	Max	Mean	Std. Dev
Standards and frameworks				
A framework for HIS standards implementation exists	1.00	5.00	2.0561	.99903
A framework for HIS standards implementation is used by Healthcare managers at different levels of the Health service	2.00	5.00	1.5405	1.14020
HIS Policy				
A policy for HIS standards implementation exists	2.00	5.00	2.4020	.99005
A policy for HIS standards implementation is used by Healthcare managers at different levels of the Health service	1.00	5.00	2.9595	.95937
Sufficiency of HIS Funding				
HIS is funded by the Ministry of Health	1.00	5.00	3.2365	1.09149
HIS is funded by Foreign Grant	1.00	5.00	2.5709	1.25213
Valid N (listwise)				

Concerning the HIS standards and frameworks, the results in Table 2 reveal that respondents strongly disagreed that a framework for HIS standards implementation existed (mean=2.0561) and that a framework for HIS standards implementation was used by healthcare managers at different levels of the health service (mean=1.5405). Similarly, respondents disagreed that a policy for HIS standards implementation existed in the health facility (mean=2.4020) and also that a policy for HIS standards implementation was used by healthcare managers at different levels of the health service (mean=2.9595). Further, when respondents were tasked to examine the parameters under funding of HIS in their health facilities, they stated that HIS was funded mainly by the Ministry of Health (mean=3.2365) and less often by foreign grants (mean=2.5709).

4.2 System Quality, Information Quality, Service Quality and Organization Performance

A number of parameters were used to examine the HIS system quality, information quality, service quality and organizational performance of HIS in the studied health facilities. Using several indicators, data was generated to analyze the performance of the health facilities in the areas of supplier management, health service enhancement, service delivery information support, service control and internal health facility efficiency. Table 3 shows the results analyzed using descriptive means:

Table3: Health Facility Performance Indicators (N=296)

Indicator	Min	Max	Mean	Std. Dev
Supplier management				
HIS are used to locate substitute sources for medical commodities	3.00	5.00	4.3784	.68796
HIS are used to ensure cost effectiveness in handling medical commodities orders	4.00	5.00	4.5439	.49891
HIS are used to ensure cost effectiveness of the supplier in replenishing medical	.00	5.00	4.4831	.87123

commodities inventory				
HIS are used to minimize uncertainty in ordering lead time	4.00	5.00	4.5743	.49528
Health service enhancement				
HIS are used by the health facility to avail services information to clients	3.00	5.00	4.3615	.63865
HIS are used by the health facility to add value to existing health services	3.00	5.00	4.5169	.55819
Service delivery information support				
HIS are used by the health facility to target health service needs with accuracy	3.00	5.00	4.3243	.67111
HIS are used by the health facility to anticipate client needs better	3.00	5.00	4.5541	.55582
HIS are used by the health facility to identify groups of clients whose needs are not being met	3.00	5.00	4.4764	.61571
Service control				
HIS are used by the health facility to minimize the cost of designing services	3.00	5.00	4.3919	.73770
HIS are used by the health facility to minimize the cost in adding features to existing services	3.00	5.00	4.2061	.68502
HIS are used by the health facility to minimize the cost of services to population grouping	3.00	5.00	4.3277	.53111
Internal Health Facility efficiency				
HIS are used by the health workers at this facility to ensure efficiency in decision making	4.00	5.00	4.8007	.40017
HIS are used by the health workers at this facility to make informed decisions	4.00	5.00	4.8514	.35634
HIS are used by the health workers at this facility to ensure efficiency in internal meetings and discussions	3.00	5.00	4.6047	.54851
HIS are used by the health workers at this facility to co-ordinate among facility departments	4.00	5.00	4.4899	.50074
HIS are used by the health workers at this facility to provide good evaluation on annual budget	2.00	5.00	4.0439	1.01586
HIS are used by the health workers at this facility to provide good evaluation on capital (fixed asset) budget	2.00	5.00	4.1318	1.05101
HIS are used by the health workers at this facility to maximize the organization's performance	3.00	5.00	4.3615	.67978
HIS are used by the health workers at this facility to maximize the organization's population coverage	3.00	5.00	4.1318	.78516

HIS are used by the health workers at this facility to maximize company's strategic planning efficiency	1.00	5.00	4.2331	.87704
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The following information was derived from the analysis of the results in Table 3:

- a. Concerning supplier management, the respondents strongly agreed that HIS are used to locate substitute sources for medical commodities (mean=4.3784); ensure cost effectiveness in handling medical commodity orders (mean=4.5439) and replenishing medical commodities inventory (mean=4.4831). It was also noted that HIS is used to minimize uncertainty in ordering lead time (mean=4.5743).
- b. As far as health service enhancement is concerned, the respondents strongly agreed that HIS are used by to avail service information to the clients (mean=4.3615) as well as add value to the existing health services (mean=4.5169).
- c. In the area of service delivery information support, the respondents strongly agreed that HIS enable the health facility to target health service needs with accuracy (mean=4.3243), anticipate client needs better (mean=4.5541) and identify groups of clients whose needs are not being met (mean=4.4764).
- d. Similarly, concerning service control, the respondents strongly agreed that HIS enable the health facilities to minimize the cost of designing services (mean=4.3919), adding features to existing services (mean=4.2061) and the cost of services to population grouping (mean=4.3277).
- e. Concerning internal health facility efficiency, the respondents strongly agreed that HIS is used by the health workers at the facilities to ensure efficiency in decision making (mean=4.8007); make informed decisions (mean=4.8514); ensure efficiency in internal meetings and discussions (mean=4.6047) as well as co-ordinate among facility departments (mean=4.4899). HIS was also used by health workers to provide evaluation on the annual budgets (mean=4.0439); capital (fixed asset) budgets (mean=4.1318); maximize the organization's performance (mean=4.3615), organization's population coverage (mean=4.1318) and the company's strategic planning efficiency (mean=4.2331).

4.3 Independent Samples t-Test Analysis for HIS Standards, Framework, Policy and Funding

An independent *t*-test was performed to determine whether two grouped independent variables including HIS Policy and Standards and frameworks influenced HIS funding in health facilities. All factors for each of these variables were computed using descriptive means to transform into one strong variable for the *t*-test analysis to be performed. A minimum mean score of 4 was used given that data was collected on a 5 point likert. This meant that those variables scoring a computed mean of 4 and above (strongly agree) significantly explained HIS funding in health facilities. Table 4 presents *t*-test results:

Table 4: Independent Samples *t*-test for HIS Standards, Framework, Policy and Funding

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
HIS Policy	Equal variances assumed	.217	.642	-1.756	294	.080	-.22356	.12728	-.47405	.02694
	Equal variances not assumed			-1.744	108.854	.084	-.22356	.12820	-.47765	.03054
Standards and frameworks	Equal variances assumed	.067	.796	1.239	294	.216	.16963	.13687	-.09974	.43901
	Equal variances not assumed			1.203	105.317	.232	.16963	.14106	-.11005	.44932

The results in Table 4 reveal that HIS standards and frameworks significantly improves HIS funding ($t = 1.239$, p value = .216, 2 tailed test) when equal variances is assumed. However, much HIS Policy was significant (p value = .080, 2 tailed test), it had a negative t value ($t = -1.756$), meaning that the group mean fell below 4 (strongly agree). Therefore we are 95% confident that once there are appropriate HIS standards and frameworks HIS funding in health facilities will improve. However, this is not the same with HIS policy because of the negative t value.

4.4 Independent Sample *t*-Test on Health Facility Performance Indicators

Further, an independent t -test was performed to determine whether the four independent variables including Supplier management, Health service enhancement, Service delivery information support, and Service control significantly explained Internal efficiency of health facilities. Factors for each of these variables were computed using descriptive means to formulate one strong variable for the t -Test analysis. A minimum mean score of 4 (strongly agree) was used given that data was collected on a 5 point likert. This meant that those variables scoring a computed mean of 4 and above significantly explained internal efficiency of Health facility performance brought about by Health Information Systems. Table 5 presents t -Test results:

Table 5: Independent Samples *t*-Test for Health Facility Performance Indicators

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Supplier management	Equal variances assumed	25.324	.000	-6.711	294	.000	-.40350	.06013	-.52183	-.28516
	Equal variances not assumed			-8.288	88.538	.000	-.40350	.04868	-.50023	-.30676
Health service enhancement	Equal variances assumed	155.507	.000	6.160	294	.067	.46517	.07552	.31655	.61380
	Equal variances not assumed			3.924	52.418	.0011	.46517	.11854	.22734	.70301
Service delivery information support	Equal variances assumed	.023	.879	8.319	294	.083	.57377	.06897	.43804	.70950
	Equal variances not assumed			7.634	63.567	.038	.57377	.07516	.42360	.72394
Service control	Equal variances assumed	18.049	.000	1.536	294	.126	.12520	.08150	-.03519	.28560
	Equal variances not assumed			1.174	56.611	.245	.12520	.10667	-.08844	.33884

The results in table 5 show that the indicators for Health facility performance are Health service enhancement ($t=6.160$, $p = .067$, 2 tailed test), Service delivery information support ($t=8.319$, $p = .083$, 2 tailed test) and Service control ($t=1.536$, $p=.126$, 2 tailed test) when equal variance is assumed. This positive t value associated with a p value $>.05$ indicates that the mean scores for these three groups of variables are significantly greater than the minimum mean of 4 (strongly agree). Hence, we are 95% confident that these three variables once incorporated in HIS strategic alignment can help improve internal efficiency of health facilities. However, t -test results indicated that Supplier management ($t=-6.711$, $p = .000$) was not significant and did not meet the minimum mean of 4 (strongly agree) in explaining internal efficiency of health facilities.

5. DISCUSSION OF FINDINGS

Results on HIS standards, frameworks, policy and funding in health facilities revealed that there were no frameworks and/or standards for HIS implementation in the health facilities. The findings serve to highlight this very important reason why most HIS initiatives fail as has been suggested (MoH, 2010; Heeks, 2006). Results of the study showed that HIS enabled the health facilities to locate substitute sources for medical commodities, ensured cost effectiveness in handling medical commodities orders, ensured cost effectiveness of the supplier in replenishing medical commodities inventory and also the HIS minimized the uncertainty in ordering lead time. These findings are in line with studies by Avila et al. (2010); Heeks (2006) and Luftman (2007). Further, in terms of healthcare enhancement, the findings revealed that HIS are used by the health facilities to avail service information to clients as well as add value to existing health services (Coiera, 2009; MoH, 2009).

Further, the findings revealed that having HIS standards and frameworks significantly improves HIS funding. This is in line with literature (e.g. see Kituyi et al., 2012; Isabalija et al., 2011). The findings on health facility performance indicators revealed that once health service enhancement, service delivery information support and service control are incorporated in the strategic alignment of HIS, there will be improved internal efficiency of health facilities. These findings are in agreement with Coiera (2009), Luftman (2007) and MoH (2009) who reported that HIS enable health facilities to target health service needs with

accuracy, anticipate client needs better and identify groups of clients whose needs are not being met. Similarly, in the area of service control, findings revealed that HIS are used by the health facilities to minimize the cost of designing services, the cost in adding features to existing services, and the cost of services to population groupings (Luftman, 2007). Findings further coincide with literature on HIS and internal health facility efficiency, where it was found that HIS was used by the health workers to ensure efficiency in decision making, make informed decisions, ensure efficiency in internal meetings and discussions, co-ordination among departments and provide good evaluation on annual budget. The findings also agree with literature that HIS were used by the health workers to provide good evaluation on capital budgets, maximize the organization's performance, maximize the organization's population coverage and maximize company's strategic planning efficiency (Heeks, 2006; Luftman, 2007).

5.1 Indicators for System Quality

On system flexibility, findings revealed that HIS was not easy to learn, and that the systems were not equipped with useful features and functions. Results also showed that HIS in the health facilities were not flexible and therefore changes to the system could not be easily done. This could be the main reason why most of the systems failed to take off since users did not match value and flexibility in them (Kohli & Deveraj, 2004; Strnadl, 2006). The results revealed the same image about system sophistication as respondents disagreed that the HIS in their health facilities were implemented using modern technology, well integrated, user-friendly, and good for documentation and also that systems minimized time lag between data input and output for batch processing.

5.2 Indicators for Information Quality

Although the findings revealed a positive note on the indicators for information quality, this was rather weak. All the indicators scored a minimal average point of agreement on whether the systems were equipped to output accurate, complete and concise information on-screen and printed outputs and also whether the systems in place produced useful information necessary for decision making. The results were also in partial agreement on the items under information format, whereby respondents reluctantly agreed that Health Information Systems generated information that appeared neatly, that was consistent and comparable to other outputs and also that the systems generated information that was easy to understand. Moreover, research shows that the success of information systems largely depends on its capability to produce consistent and well formed reports that are easy to understand by decision makers (Kohli & Deveraj, 2004; Strnadl, 2006).

6. CONCLUSION AND RECOMMENDATIONS

This study sought to examine the current state of strategic alignment of HIS in health facilities by identifying and analyzing the prevailing dynamic antecedents. The results on the state of strategic alignment of HIS in health facilities, as presented and discussed revealed that although managers of health institutions acknowledged that strategic HIS planning was important, most of them did not know how they would strategically align the HIS. Consequently, most HIS were not in tandem with organizational vision, goals and objectives. This made it very difficult for health institutions to optimally utilize their HIS. The effect of this was poor access to information, delayed and sometimes poor decision making, lack of adequate information security resulting from poor record keeping practices and systems (Bleistein & Cox, 2006).

Additionally, it was found that most health facilities did not have electronic information systems (Strnadl, 2006). This was mainly because of lack of adequate resources

to procure the necessary equipment. The data also suggested that since establishment and use of modern HISs was not considered as part the organizational strategic goals, it was very difficult to properly plan for them. Hence, it was not by surprise that many health facilities operated using manual systems. According to Strnadl (2006), using manual systems presents organizations with many challenges among which include loss of data, data inconsistencies and inaccurate reporting. More so, it was established that the health facilities did not have policies, frameworks and or standards for guiding the implementation and use of HIS (MoH, 2010). Heeks (2006) argues that the lack of proper policies, standards and or models for implementation systems accounts for most of the failure rates of information systems in developing countries.

For better alignment of HIS, this study recommends that there should be HIS standards and frameworks to improve funding of HIS projects. Further, for improved internal health facility efficiency, performance indicators such as Health service enhancement, Service delivery information support and Service control should be incorporated in the strategic alignment of HIS. This will help identify the much needed resources for implementation and sustainability. Managers should also be trained on the importance of strategic alignment of HIS so that they can change their perceptions which have been largely due to ignorance and lack of knowledge. Further, health facilities should be encouraged to adopt electronic information systems to improve on their efficiency and effectiveness. It was noted that most of the health did not have electronic records keeping and other information systems which denied them many opportunities that computerized system could offer.

Most important also is that governments through relevant ministries such as the Ministry of Health and the Ministry of ICT should develop policies, frameworks and or standards for guiding the implementation and use of HIS in health facilities since this study established that no single health facility had policies, standards and or frameworks for HIS.

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Appendix A

Survey questionnaire

MAKERERE UNIVERSITY Quantitative Survey Questionnaire

Dear respondent,

My name is **Mary Odiit**; I am carrying out a study on **Strategic Alignment of Health Information Systems**. The purpose of this study is to **develop a model for Health Information Systems Strategic Alignment**. The study is purely academic and it will benefit other studies on how to improve on the **development and management of Health Information Systems**. You have been carefully selected to participate in this study because of your technical expertise in Health Information Systems field.

The answers given will be kept confidential. Participation in This study is completely voluntary. You are free to withdraw from the study at any time. Your participation is vital to the success of Health Information Systems research.

Thank you, very much.

SECTION A: Background Information

Please provide your background information below:

- Age bracket: i) 18-27 years []
 ii) 28-37 years []
 iii) 38-47 years []
 iv) 48-57 years []
 v) 58 and above []
- Highest academic qualification: i) Certificate []
 ii) Diploma []
 iii) Degree []
 iv) Masters []
 v) PhD []

Title:

Name of Health Organization:

- Health Organization Category: i) Regional Referral Hospital []
 ii) Health Centre IV []
 iii) Health Centre III []
 iv) Health Centre II []
 v) Centre of Excellence []

SECTION B: Strategic Factors in Health Information System Alignment

Please tick the most suitable response below on a scale of 1-5 such that 1=Strongly Disagree, 2=Disagree, 3=Not Sure, 4=Agree and 5=Strongly Agree about **Strategic Factors in Health Information System Alignment** in your organization:

	(1 = strongly disagree, 5 = strongly agree)	1	2	3	4	5
	Indicator/item description					
1	Strategic Parameters					
A	The Health Care Managers use the Health Service strategy/plan as a guide for planning and service delivery					
B	A documented Health Information Systems strategy/plan exists					
C	Health Information Systems and Health Care Managers use the Health Information Systems strategic document					
D	Health Information Systems Managers' develop systems based on the Health Care Managers' decisions					
E	Strategic Health Information Systems planning is important for Health facilities/ Organizations					
F	Strategic Health Information Systems planning is important for all Health facilities organizations					
G	Health Information Systems Strategic planning is difficult to perform					
H	IS objectives have a direct relationship to national Health Service Objectives					
I	Senior management's perception of Health Information Systems value is accurate					
J	Communication between Health Information Systems and Health Care Managers effective					
K	The managers understand the relationship between the Health Service and Health Information Systems strategies					
L	Strategic Health Information Systems planning important for Health Care Organizations					
M	Strategic Health Information Systems planning is important for all Health organizations					
N	Health Information Systems Strategic planning is difficult to perform					
O	Health Information Systems objectives have a direct relationship to corporate Health Service Objective					
P	Senior management's perception of Health Information Systems value is accurate					
Q	Communication between Health Information Systems and Health Care Managers effective					
R	The managers understand the relationship between the Health Service and Health Information Systems strategies					
S	Information access standards are systematic and easily understood by Managers					
T	The existing Health Information Systems applications generate information that is relevant to the organization's and Mission					
U	Most of the health care processes are supported by electronic systems					
V	Continuous technology assessments are important for determining					

	IS needs for execution of strategic objectives					
W	Strategic alignment is well understood by Health Care managers					
X	Health Information Systems and Health Care Managers engage in strategic alignment planning and implementation					
Y	Health Information Systems and Health Care Managers have access to tools for strategic alignment analysis					
2	Health Information Systems standards Framework					
A	A framework for Health Information Systems standards implementation exists					
B	A framework for Health Information Systems standards implementation is used by Health care managers at different levels of the Health service					
3	Health Information Systems Policy					
A	A policy for Health Information Systems standards implementation exists					
B	A policy for Health Information Systems standards implementation is used by Health care managers at different levels of the Health service					
4	Health Information Systems Funding is sufficient					
A	Health Information Systems funded by Ministry of Health					
B	Health Information Systems funded by Foreign Grant					
C	Health Information Systems funded by other Funder(s) (please list them below)					

SECTION C: System Quality, Information Quality, Service Quality and Organization Performance

Please tick the most suitable response below on a scale of 1-5 such that 1=Strongly Disagree, 2=Disagree, 3=Not Sure, 4=Agree and 5=Strongly Agree about **System Quality, Information Quality, Service Quality and Organization Performance** in your organization:

	(1 = strongly disagree, 5 = strongly agree)	1	2	3	4	5
	Indicator/item description					
1	Health facility/ Organization performance					
a)	Supplier management (four items)					
	Health Information Systems helps us to:					
I	Locate substitute sources for medical commodities					
ii	Ensure cost effectiveness in handling medical commodities orders					
iii	Ensure cost effectiveness of the supplier in replenishing medical commodities inventory					
iv	Minimize uncertainty in ordering lead time					
b)	Health service enhancement (two items)					
	Health Information Systems helps the facility:					
I	To avail services information to clients					
ii	To add value to existing health services					
c)	Service delivery information support (three items)					
	Health Information Systems helps the health facility to:					
I	Target health service needs with accuracy					
ii	Anticipate client needs better					

iii	Identify groups of clients whose needs are not being met					
d)	Service control (four items)					
	Health Information Systems helps the health facility to:					
I	Minimize the cost of designing services					
Ii	Minimize the cost in adding features to existing services					
iii	Minimize the cost of services to population grouping					
e)	Internal Health Facility efficiency (eight items)					
	Health Information Systems helps health workers at Health Information Systems facility to:					
I	Ensure efficiency in decision making					
Ii	Make informed decisions					
iii	Ensure efficiency in internal meetings and discussions					
iv	Co-ordinate among facility departments					
V	Provide good evaluation on annual budget					
vi	Provide good evaluation on capital (fixed asset) budget					
vii	Maximize the organization's performance					
viii	Maximize the organization's population coverage					
ix	Maximize company's strategic planning efficiency					
2	Indicators and items for System Quality					
a)	System flexibility (three items)					
	Health Facility information system is:					
I	Easy to learn					
Ii	Equipped only with useful features and functions					
iii	Flexible to make changes easily					
	(1 = strongly disagree, 7 = strongly agree)	1	2	3	4	5
	Indicator/item description					
b)	System Health Information Systems sophistication (six items)					
	The HIS are:					
I	Implemented using modern technology					
Ii	Well integrated					
iii	User-friendly					
iv	Good for documentation					
V	Minimizing time lag between data input and output for batch processing					
3	Indicators and items for Information Quality					
a)	Information content (five items)					
	Information outputs (including on-screen and printed outputs) are:					
I	Accurate					
Ii	Complete					
iii	Concise					
Iv	Useful in our daily jobs					
V	Relevant for decision making					
b)	Information format (three items)					
	The Health Information Systems generates information					

	that:					
I	Has good appearance					
ii	Is comparable to other outputs (consistency)					
iii	Is easy to understand					
4	Indicators and items for Service Quality(continued)	1	2	3	4	5
a)	Reliability (five items)					
I	When Health Information Systems promises to do something by a certain time, it does so					
ii	When users have a problem, Health Information Systems Staff show a sincere interest in solving it					
iii	Health Information Systems provides its services at the time it is expected to do so					
iv	Health Information Systems insists on error-free records					
b)	Responsiveness (four items)					
I	Health Information Systems tells users exactly when services will be performed					
ii	Health Information Systems employees give prompt service to users					
iii	Health Information Systems employees are always willing to help users					
iv	Health Information Systems employees are never too busy to respond to users' requests					
c)	Assurance (three items)					
I	Users will feel safe in their transactions with Health Information Systems' employees					
ii	Health Information Systems employees are consistently courteous with users					
iii	Health Information Systems employees have the knowledge to do their job well					
d)	Empathy (four items)					
I	Health Information Systems staff give users individual attention					
ii	Health Information Systems department has operating hours convenient to all its users					
iii	Health Information Systems department has the users' best interests at heart					
iv	Staff in the Health Information Systems department understand the specific user needs					

SECTION D: Facility Capacity and Government Support for Health Information Systems Strategic Alignment

Please tick the most suitable response below on a scale of 1-5 such that 1=Strongly Disagree, 2=Disagree, 3=Not Sure, 4=Agree and 5=Strongly Agree about **Facility Capacity and Government Support for Health Information Systems Strategic Alignment** in your organization:

	(1 = strongly disagree, 5 = strongly agree)	1	2	3	4	5
	Indicator/item description					
1	Health Information Systems Capacity					

a	The Health Information Systems officers maintain high quality patient records					
b	The Health Information Systems officers follow existing guidelines for managing patient records					
c	The Health Information Systems officer have received formal training on use of HMIS					
d	The Health Information Systems officers refer to guidelines and procedures for records management					
e	The Health Information Systems officers/Facility In Charge generate reports regularly					
f	The Health Information Systems officers/In Charge adhere to reporting timelines					
g	The Facility has an electronic database for data management					
h	The Facility In Charge receives feedback from the HSD					
i	Health Information Systems officer/Facility In Charge uses the data for planning and budgeting					
j	Health Information Systems officers/Facility In Charge understand the objective for data management					
k	The Health Information Systems officer is an information management professional					
l	The physical patient records are well kept					
2	The Government Support to Health Information Systems					
a	Communication between Health Information Systems and Health Care Managers effective					
b	Health Information Systems officers/Facility In Charge receive regular training on new technologies					
c	Health Information Systems officers/Facility In Charge receive technical support from the district level technical persons					
d	Health Information Systems officers/Facility In Charge are facilitated to conduct support supervision to lower level facilities					
e	The facility has an Health Information Systems/records officers					
f	Health Information Systems has a specific budget vote from the Ministry of Health					
g	The Health Facility is equipped with Computer equipment for Health Information Systems management					
h	Communication between Health Information Systems and Health Sub District level is effective					

SECTION E: Requirements for Strategic Alignment of Health Information Systems

Please tick the most suitable response below on a scale of 1-5 such that 1=Strongly Disagree, 2=Disagree, 3=Not Sure, 4=Agree and 5=Strongly Agree about the **Requirements for Strategic Alignment of Health Information Systems** in your organization:

(1 = strongly disagree, 5 = strongly agree)		1	2	3	4	5
	Requirement					
1	Business strategy requirements					
a	There should be top-level strategic planning for information systems in the Health facility					
b	There should be a framework for HIS implementation in the Health facility					
C	There should be standards to guide users in implementation and use HIS					
D	There should be a policy for HIS activities in the Health facility					
F	There should be high-level resource mobilization to fund HIS projects in the Health facility					
2	Business process requirements					
A	HIS work processes should be well defined to enable staff use HIS effectively					
B	Employees should be trained about business processes					
C	There should be sensitization of users about business processes					
D	HIS should minimizing time lag between data input and output for batch processing					
E	HIS should be well integrated					
F	HIS should be equipped only with useful features and functions					
G	HIS should cover all functions of the organization					
H	HIS should be implemented using modern technology					
3	Information system design requirements					
A	HIS should be user friendly					
B	HIS should be easy to use					
C	HIS should be flexible					
D	HIS should be fast					
E	HIS should be secure					
F	HIS should be error free					
4	Information system strategy requirements					
A	HIS should be affordable					
B	HIS should be easy to maintain					
C	HIS should allow repairs and modifications					
D	HIS should be easy to learn					
E	Employees should be trained about HIS					
F	There should be sensitization of users about HIS					

Please write any other comments on the issues not covered in the above tables below:

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Thank You